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Tax Competition, Capital Mobility, and Innovation in the Public Sector

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Michael Rauscher*

Abstract

The paper analyses the impact of tax competition on innovation in the public sector. It is shown that the effects of increased mobility of the tax base on innovation and growth are ambiguous. The negative relationship is more likely, however. Moreover, it is shown that a Leviathan government may be induced to spend a larger share of its budget on unproductive activities.

JEL codes: H21, H7, O31, 041

Keywords: tax competition, economic growth, innovation, Leviathan

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1 The issue

The modernisation of government and public administration has been on the agenda in many industrialised countries (and in several developing ones as well) for at least two decades. The ultimate objective of this process is a "lean state" or "lean government", serving the citizen's needs without excessive bureaucracy and at low costs. Turning a bureaucratic government into a lean one involves reorganisation of procedures and the introduction of new technologies in order to save resources and produce public-sector services more efficiently. In other words: the state must innovate. In practice, this innovation includes the introduction of modern management techniques (often adapted from the private sector of the economy), the implementationof cost accounting, and the use of modern information technologies. See Osborne and Gaebler (1992), for example.

What has driven this strive for efficiency? One might argue that it is, at least in part, a backlash to the expansion of the interventionist state that many countries experienced in the 1960s and 1970s. An additional explanation is that tighter budgets, originating from the rise of public debt and, more recently, from demographic pressure raising the burden of public-pension expenditures, limit the discretion of policy makers and public servants. A third driving force is – arguably – tougher competition amongst jurisdictions for mobile factors of production. Since the 1980s, the international mobility of factors of production, in particular physical and human capital has been increasing substantially, resulting in the accelerating growth of foreign direct investment, for example. Capital and other mobile factors, however, constitute significant parts of the tax base. With increased mobility, this tax base becomes more elastic and high tax rates become less feasible. Thus, the government's monopoly power vis à vis the tax base is diminished. The threat that mobile factors leave jurisdictions that have high tax rates and mediocre public-sector services and move elsewhere restricts the policy maker's discretion. To avoid the emigration of the mobile parts of the tax base, governments must reduce taxes and/or improve the supply of public services. With tax revenue being the input and public services the output, the state is forced to reduce the input/output ratio of its production process. Public-sector efficiency rises. The first authors describing the role of interjurisdictional competition in moving closer to the ideal of the lean state are Brennan and Buchanan (1980, ch. 9). In their view, interjurisdictional competition is an appropriate means to tame the wasteful Leviathan states and replace it by a more efficient one that better serves the needs of the citizen.

More recently, Keen (1996) and Rauscher (2000) used formalised tax-competition models to address the issue and they showed that the results of tax competition are ambiguous. There are two effects. On the one hand, tax competition raises the opportunity cost of the Leviathan's rent seeking behaviour and this contributes to the taming of Leviathan. On the other hand, tax competition induces fiscal externalities, which is bad and reduces welfare. A limitation of these models is their static nature: they derive the effects of an increase in mobility merely on the equilibrium of a static economy. However, innovation in the public sector is inherently a dynamic process. Instead of merely reacting once to a change in tax-base mobility, the public sector is forced to innovate continuously. The question then is whether a change in mobility does not only have a one-time comparative static effect, but also induces a permanent rise in the rate of innovation and, thus, the rate of economic growth.

Thus, this paper poses an old question: is competition good for innovation and growth? However, unlike in the standard IO literature on the effects of competition on innovation, the object of the following analysis is not the private firm, but the public sector. To keep matters simple, I look at a static capital allocation model and combine it with a dynamic model of accumulation of "technological" knowledge in the public sector. Of course this is a drastic simplification, but it helps to disentangle competition effects from incentives to manipulate the growth path. See Rauscher (2005) for such a model where Leviathan's preferences differ from those of the voter such that distortive taxation is used to change the growth path. Results turn out to be ambiguous and are hardly interpretable in such a general model. Therefore, in order to concentrate on tax competition and public-sector innovation, I will neglect private-capital accumulation. It will be seen that even with the simplification of a constant capital stock the results are by no means trivial, but nonetheless the economic intuition is rather straightforward. The paper is organised as follows. The next section introduces the model. The optimality conditions are derived in Section 3. Section 4 is devoted to the investigation of the impact of parameter changes on innovation and growth and Section 5 contains some short remarks on deficiencies of the modelling approach and directions of future research.

2 The Model

Consider a world composed of a continuum of identical and infinitely small jurisdictions. If the tax base is mobile, the government of a jurisdiction tries to attract it, e.g. by lowering tax rates or by supplying better government services. At the end of the day, however, governments find out that all of them have taken the same action and the location of the tax base remains unaffected. In this paper, we look at a single representative jurisdiction that takes the interest rate on the capital market as given. Later on, the interest rate will be endogenised via the equality of supply and demand on the capital market. The tax base is private capital installed in this jurisdiction, $K(t)$, and the policy instrument is a source-based capital tax, $\Theta(t)$. t denotes time. As the analysis proceeds, the time argument will be dropped for notational convenience where this does not cause ambiguities. Each jurisdiction is endowed with a fixed capital stock $K(0)=K_0$ and the allocation of capital is – under perfect competition – governed by the marginal-productivity rule. Assume that output is a function of private capital and a time-dependent efficiency parameter, $A(t)$, taken as given by private agents. This efficiency parameter depends on the supply of public sector-capital. For simplicity assume a linear relationship and choose units such that $A(t)$ is public sector-capital. Let the production function be $A(t)F(K(t))$. With $r(t)$ as the world market interest rate, the private sector's allocation of capital is determined by $AF' - \Theta = r$ and it follows that higher tax rates induce capital flight:

$$\frac{dK}{d\Theta} = \frac{1}{AF''} < 0 .$$

As usual primes denote derivatives of univariate functions. The capital-flight elasticity of taxation, defined as a positive parameter, then is

$$\varepsilon = \frac{-\Theta}{AKF''} > 0 . \qquad (1)$$

Without interjurisdictional capital mobility, ε would be zero. ε is the central parameter in this paper and it will be shown how changes in ε affect the rates of innovation and growth in the economy.

Private-sector income, $Y(t)$, is output plus income from domestic capital employed in other jurisdictions minus tax payments:

$$Y = AF(K) + r(K_0 - K) - \Theta K . \qquad (2)$$

If $K_0 - K < 0$, this indicates that foreign capital is used in the domestic economy such that $r(K_0 - K)$ is the capital income paid to foreigners. Ex post, $K_0 - K$ will be zero, but ex ante this difference matters.

The government is a wasteful Leviathan and extracts a rent out of the tax revenue. In practice, this rent may take the shape of salaries exceeding marginal productivity, leisure on the job, and unproductive status seeking in public-sector hierarchies. Let $G(t)$ be productive government spending. Then the rent is

$$R = \Theta K - G . \tag{3}$$

Productive government spending enhances the public sector's capital stock. A is the public sector's knowledge capital. It is commonplace to assume that old knowledge is needed to produce new knowledge. Let the production of new knowledge be subject to a constant-returns-to-scale production function, $H(A,G)$ with positive first derivatives, negative second derivatives and a positive cross derivative. Denoting a derivative with respect to time by a dot above the corresponding variable, public-sector innovation proceeds according to

$$\dot{A} = H(A,G) . \tag{4}$$

For the derivation of some of the results, $H(.,.)$ is specified as a Cobb-Douglas function with elasticities α and $(1-\alpha)$ with $0<\alpha<1$:

$$\dot{A} = A^{\alpha} G^{1-\alpha} . \tag{4'}$$

This specification is closely related to the one proposed by Jones (1995) for private-sector innovation in an economic-growth framework. The underlying idea is that an increase in existing knowledge indeed reduces the resources needed to generate new knowledge, albeit at a declining rate. Jones (1995) shows that the traditional assumption on innovation technology, that H is linear in A, which was originally introduced by Shell (1966) and is still omnipresent in the economic-growth literature, produces unrealistic results. He argues instead that the rate of arrival of new inventions rises at a declining rate if the stock of knowledge is increased. In his own words, this "corresponds to the case referred to in the productivity literature as 'fishing out' " (Jones, 1995, p. 765). Like in many other models used in the economic growth literature, I abstract from the stochastic nature of innovation and model *H*(.,.) as a reduced deterministic form of the underlying stochastic process of innovation. Using the constant-returns-to-scale property of the *H*(.,.) function, equation (4') can be rewritten:

$$\hat{A} = H\left(1, \frac{G}{A}\right) = g^{1-\alpha}, \tag{4''}$$

where the hat above the variable denotes the growth rate and $g=G/A$. Thus, $\hat{A} = g^{1-\alpha}$ is the rate of innovation in the public sector.

The government is a utility-maximising Leviathan caring about its rent income and about its political support from the voter. The proxy for political support is private income. For the sake of tractability, we assume an additively separable iso-elastic utility function and a constant discount rate, δ:

$$\int_0^\infty e^{-\delta t} u(R,Y)dt = \int_0^\infty e^{-\delta t}\left[\frac{R^{1-\sigma^{-1}}-1}{1-\sigma^{-1}} + \Omega\frac{Y^{1-\sigma^{-1}}-1}{1-\sigma^{-1}}\right]dt. \tag{5}$$

Ω is a parameter measuring the weight the Leviathan government attaches to political support: the larger this parameter, the larger is the impact of the voter on government decision making. σ has two meanings. On the one hand, it is the intertemporal elasticity of substitution. On the other hand, it is the elasticity of substitution between rent income and political support. Of course, more general specifications allowing for different values of the elasticities are possible, however at the cost of a loss of tractability of the model. However, since results turn out to be ambiguous even with the simple specification, not much would be gained by using a more general utility function.

3 Solution

The Leviathan maximises utility, (5), subject to conditions (1) to (4) and to the exogenous initial endowment, $A(0)=A_0$, with respect to Θ and G. It should be noted that all Leviathans in all jurisdictions face the same optimisation problem and solve it in the same way. Thus, the results derived for an individual jurisdiction generalise to the world as a whole.

Let $\lambda(t)$ be the costate variable or shadow price of public-sector knowledge capital, $A(t)$. The current-value Hamiltonian is

$$\mathcal{H} = u\big(\Theta K - G, AF(K) - \Theta K - r(K_0 - K)\big) + \lambda H(A,G)$$

and the optimum is determined by the following conditions:

$$\dot{\lambda} = (\delta - H_A)\lambda - u_Y F \,, \tag{6a}$$

$$\lambda H_G = u_R \,, \tag{6b}$$

$$\frac{u_R}{u_Y} = \frac{\Omega}{1-\varepsilon} \,, \tag{6c}$$

where subscripts denote partial derivatives and arguments of functions are omitted for the sake of expositional brevity. (6a) is a typical canonical equation, driving the dynamics of the shadow price. (6b) is the first-order condition with respect to G relating the Leviathan's current utility loss from forgoing part of the rent income, u_R, to the long-run gains of spending the savings productively, λH_G. Equation (6c), derived from maximisation with respect to Θ, states that capital mobility raises the Leviathan's opportunity cost of rent seeking. Without capital mobility, each unit of rent costs Ω units of political support. With capital mobility, a tax increase that reduces political support by one unit generates less than Ω units of Leviathan rent since higher taxes erode the tax base. Equivalent results can be found in the static models discussed by Edwards and Keen (1996) and Rauscher (2000).

Due to the assumption of constant returns to scale, the model generates a steady-state growth path with a constant growth rate. This growth rate equals the rate of innovation defined in equation (4"). All relevant variables grow at this rate:

$$\hat{A} = \hat{G} = \hat{\Theta} = \hat{R} = \hat{Y} = H(1, g) = g^{\alpha - 1} \tag{7}$$

In the equilibrium, in which all jurisdictions choose the same tax rate and the same investment path $G(t)$, the remuneration of capital, r, is endogenous. r is determined by the capital market equilibrium, $r = AF'(K_0) - \Theta$, and grows at the same rate as the other variables.

Establishing growth rates in (6b) and using (6a) to eliminate λ and (6c) to substitute for the Leviathan's marginal rate of substitution yields

$$H(1, g)) = \sigma[H_A(A, G) + (1-\varepsilon)F(K_0)H_G(A, G) - \delta]. \tag{8}$$

This is a modified variant of Ramsey's rule of optimum saving. A large discount rate reduces the incentive to save and invest and thus reduces economic growth. The term $(H_A + (1-\varepsilon)FH_G)$ represents the marginal productivity of knowledge capital in the production of new knowledge capital. Its first component is the direct productivity effect, H_A. There is an additional indirect effect since an increase in knowledge raises income at by a factor F and the government can convert this income into productive spending, which has an effect H_G on capital accumulation. However, due to inefficient taxation, this component is diminished by a factor smaller than one depending on the capital-flight elasticity, ε. Finally, σ is the elasticity of intertemporal substitution and it has the usual impact of dampening or accelerating the growth process without affecting sign of the growth rate. Using the Cobb-Douglas specification of the $H(.,.)$ function, equation (8) can be rewritten:

$$g^{1-\alpha} = \sigma\left(\alpha g^{1-\alpha} + (1-\alpha)(1-\varepsilon)Fg^{-\alpha} - \delta\right). \tag{8'}$$

This equation contains only one unknown, g, and it is independent of the parameter Ω, which measures the degree to which voter concern restricts the rent-seeking behaviour of the Leviathan government. Thus, the condition determining the level of public expenditure appears to be independent of the degree of government discretion. It is indeed possible to show that conditions (8) and (8') continue to hold if the government is a benevolent welfare maximiser instead of a rent-seeking Leviathan. Thus, we obtain a kind of separation theorem:

Proposition 1

The optimal choice of productive government expenditure is independent of the degree to which the voter's will is taken into account by the government.

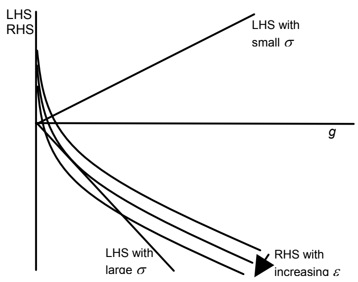
A similar result has been obtained by Rauscher (2000) in a static framework. This implies that the government's optimisation problem consists of two separate parts. Both a welfare maximiser and a Leviathan will choose efficient paths of productive expenditure. However, when it comes to taxation, the Leviathan will use higher tax rates in order to finance its own rent income on top of the productive expenditure. The next section will show that this conjecture is indeed correct.

4. Effects of capital mobility in productive expenditure and taxation

Trajectories need to be derived for the control variables, Θ and G, and the state variable, A. Since they grow at the same rate in the equilibrium, the steady state is determined by the ratios of these variables. One of them is g=G/A. The other one will be chosen as tax revenue over productive expenditure: $\theta = \Theta K / G$. I start with the impact of ε on g. Equation (8') cannot be solved algebraically but it can be be rewritten such that

$$\left(\frac{1}{\sigma} - \alpha\right)g = (1-\alpha)(1-\varepsilon)F - \delta g^{\alpha}. \tag{8''}$$

The left-hand-side (LHS) of (8") is increasing or decreasing in g depending on how large the elasticity of intertemporal substitution is. If σ is small, the term in brackets is positive. If it is larger than $1/\alpha$, which is larger than 1, the term in brackets is negative. The right-hand side (RHS) is a negatively sloped and convex function of g with a positive intercept. This intercept depends negatively on ε. Figure 1 shows the LHS of (8") as a straight line and the RHS as a downward-sloping convex curve. Two values of σ and three values of ε are considered. The following results can be derived



: Figure 1: Graphical representation of Equation (8") (*enlarged version of the figure in the appendix*)

- If $\sigma < 1/a$, then there is a unique solution of equation (8"). Moreover, it is obvious that the equilibrium value of g is reduced if the mobility parameter, ε rises.

- If $\sigma > 1/a$, then equation (8") may have no solution, one solution, or two solutions. The single solution is the tangency solution to be seen in the lower quadrant in Figure 1. If mobility is large, then there are two solutions for g, the larger one being increased and the smaller one being reduced if ε is increased further. If ε is small, there may be no solution at all.

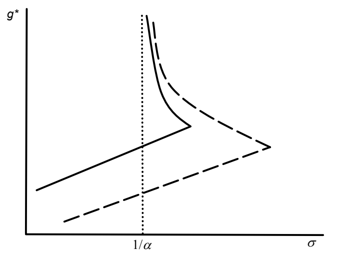


Figure 2: Comparative statics-effects on relative government expenditure, g^*

(*enlarged version of the figure in the appendix*)

Figure 2, which follows directly from Figure 1 depicts the equilibrium value of *g, g**, as a function of σ and shows what happens if ε rises. The effect of a larger value of ε on this function is shown by the dashed line. It is seen that in the case of two equilibria, one of the equilibrium values is increased whereas the other is reduced. Algebraically this follows from differentiating equation (8"):

$$\frac{dg}{d\varepsilon}=\frac{(1-\alpha)F}{\left(\alpha-\frac{1}{\sigma}\right)-\alpha\delta g^{\alpha-1}}. \tag{9}$$

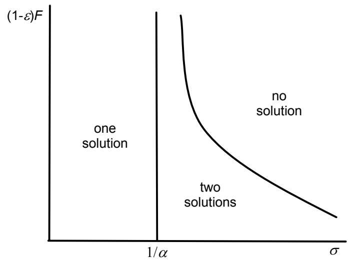


Figure 3: Bifurcation Diagram

(*enlarged version of the figure in the appendix*)

Finally a bifurcation diagram in a (σ,ε) space can be drawn. See Figure 3. For $\sigma=1/\alpha$, a first bifurcation occurs. To the left of this locus, there is only one equilibrium. To its right, a second equilibrium occurs. The second bifurcation locus depicts the combinations of σ and ε, for which we have tangency solutions, i.e. the transition from two equilibria to no equilibrium at all. This line is determined by[1]

$$(1-\varepsilon)F = \delta^{\frac{1}{1-\alpha}}\left(1-\frac{1}{\alpha\sigma}\right)^{\frac{\alpha}{\alpha-1}}.$$

Thus, there is a variety of results, which are summarised in Proposition 2. Note that there is a monotonous relationship between the relative expenditure on innovation, g, and the rate of innovation, $g^{1-\alpha}$. Thus, one can conclude.

Proposition 2

If the elasticity of intertemporal substitution is small, an increase in capital mobility reduces the rate of innovation and, thus, the growth rate of the economy. If the elasticity of intertemporal substitution is large, the impact of an increase in mobility is ambiguous.

The critical value for the elasticity of substitution is the inverse of the innovation elasticity of the stock of innovations, $1/\alpha$, and this inverse is larger than one. Thus, σ must be considerably larger than one to generate multiple equilibrium innovation and growth rates. Empirical evidence suggests, however, that σ is small. Hall (1988) derived estimates close to zero. A recent study by Guvenen (2005), which distinguishes between stockholders and non-stockholders, arrives at larger estimates for the aggregate elasticity of intertemporal substitution which are nevertheless smaller than one. Thus, although σ>1 is theoretically possible, it is unlikely to be an empirically relevant case. Therefore, one is driven to conclude that for realistic parameters of the model the rate of innovation is a declining function of interjurisdictional capital mobility. This is a typical

[1] The locus can be derived by noting that in the tangency point the derivatives of the LHS and of the RHS of (8") must be equal. Together with (8") itself this generates a system of two equations in three variables, g, σ, and ε, of which g can be eliminated.

tax competition result. Like in the static models of tax competition, there tends to be an underprovision of public goods. See Zodrow and Mieszkowski (1986) for example and, for an overview, Wilson (1999). The intuition for the result is that an increased mobility of the tax base induces a tougher competition to attract this tax base. This induces too-low taxes and less-than-optimal supply of public-sector services. In our model, the service provided by the public sector is innovation. Therefore, it is not surprising that tighter competition leads to less innovation.

Finally, I wish to address the question of the taming of the Leviathan. What is the impact of increased mobility and tougher competition on taxation and on the Leviathan's capability to appropriate rents out of the tax revenue? Using the CES properties of the utility function, the first-order condition (6c) can be rewritten such that

$$\frac{F}{g} - \theta = \left(\frac{\Omega}{1-\varepsilon}\right)^{\sigma} (\theta - 1) \tag{10}$$

where $\theta = \Theta K / G$. It is seen that, at a first glance, an increase in capital mobility, ε, seems to have the same effect on equation (9) as an increase in the weight of private welfare, Ω, in the Leviathan's objective function. However the change in the mobility parameter affects the rate of innovation, whereas the weight parameter doesn't. Algebraically, the impact of a change in ε on θ is:

$$\frac{d\theta}{d\varepsilon} = \frac{-\sigma \dfrac{\theta - 1}{1-\varepsilon}\left(\dfrac{\Omega}{1-\varepsilon}\right)^{\sigma} - \dfrac{F}{g^2}\dfrac{dg}{d\varepsilon}}{1 + \left(\dfrac{\Omega}{1-\varepsilon}\right)^{\sigma}} \tag{11}$$

The denominator on the RHS is unambiguously positive. The first part of the numerator on the RHS is negative, the second part is positive since $dg/d\varepsilon$ is negative for realistic values of σ.[2] Thus, there are two opposing effects. The first one is a taming-of-the-Leviathan effect which reduces the tax rate implemented to finance a given level of productive spending, *G*. The second effect points into the opposite direction and an interpretation can be derived via (6c). The reduction of productive spending due to fiscal externalities affects the Leviathan's rate of substitution such that the marginal utility of the rent is reduced compared to the marginal utility of political support. To reverse this effect, the Leviathan raises the tax rate. Note that this effect dominates if the weight of voter's welfare in the Leviathan's objective function, Ω, is small. Among other parameters, the elasticity of substitution plays an important role for the relative strength of the two effects that determine $d\theta/d\varepsilon$. If σ is large, the taming-of-Leviathan effect dominates; if σ is small, $d\theta/d\varepsilon$ can be positive and, contrary to intuition, more competition makes the government use a larger share of its budget for unproductive rent-seeking.

> *Proposition 3*
>
> *If the elasticity of substitution between rent income and political support is large, then an increase in mobility reduces the tax- revenue productive-expenditure ratio, i.e. the Leviathan government appropriates a smaller share of its tax revenue for its own consumption. The result is reversed if the elasticity of substitution is large.*

This result is closely related to that derived by Rauscher (2000) in a static model. If rent income and political support are good substitutes, the increase in the opportunity cost of appropriating rent income after an increase in the capital-flight elasticity makes the government substitute political support for rent income. If rent and political support are only weak substitutes, the change in the opportunity cost generates only a small

[2] It should be noted that $dg/d\varepsilon$, determined by equation (9), contains parameters such as α

substitution effect and the opposing effect via the reduction in g, which has been discussed above, dominates.

5 Final remarks

The paper has shown that the impact of increased factor mobility on the government's innovation effort is likely to be negative. Under special circumstances, the converse is also possible, but this can only occur only for unrealistically large values of the elasticity of intertemporal substitution. Moreover, it has been shown that this possibility is closely related to multiple and vanishing equilibria.

The obvious shortcoming of the model is the asymmetry between private and public capital. Private capital was assumed to be constant in this paper, but governments were able to accumulate public-sector knowledge capital. This assumption is responsible for two rather unrealistic features of the model. Firstly, the public sector is the exclusive growth locomotive in this economy. And secondly, the rate of return to private capital goes to infinity along the growth path. Extensions of the model should therefore, endogenise the accumulation of private capital. This would imply that a second source of economic growth is introduced and, moreover, that the rate of return can be constant. There are two possibilities of endogenising capital accuulation. One of them is to assume that interjurisdictional movements of capital are costly but nevertheless possible with infinite speed. See Lejour and Verbon (1997) for such a model. I expect that the results derived in my model carry over to that class of models. The other way of looking at the issue of interjurisdictional capital movements assumes frictional costs that impede the rapid adjustment of capital to differences in the rates of return across jurisdictions. Wildasin (2003) introduced such frictional costs in a simpler

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and δ that do not occur elsewhere on the right-hand side of equation (10).

dynamic model in which a constant steady state – rather than a balanced growth path – is approached in the long run. It is this latter type of models which is more realistic and, therefore, more promising. But this is also the more difficult and challenging task to extend these frictional-cost models into an economic-growth context.

References

Brennan, G, J.M. Buchanan, 1980, The Power to Tax: Analytical Foundations of a Fiscal Constitution, Cambridge: Cambridge University Press.

Edwards, J., M. Keen, 1996, Tax Competition and Leviathan, European Economic Review 40, 113-140.

Guvenen, F., 2005, Reconciling Conflicting Evidence on the Elasticity of Intertemporal Substitution: A Macroeconomic Perspective, Department of Economics, University of Rochester: Unpublished Manuscript.

Hall, R.E., 1988, Intertemporal Substitution in Consumption, Journal of Political Economy 96, 339-357.

Jones, C.I., 1995, R&D-Based Models of Economic Growth, Journal of Political Economy 103, 759-784.

Lejour, A.M., H.A.A. Verbon, 1997, Tax Competition and Redistribution in a Two-Country Endogenous-Growth Model, International Tax and Public Finance 4, 485-497.

Osborne, D., T.A. Gaebler, 1992, Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector, Reading, MA: Addison-Wesley.

Rauscher, M., 2000, Interjurisdictional Competition and Public-Sector Prodigality: The Triumph of the Market over the State?, Finanzarchiv 57, 89-105.

Rauscher, M., 2005, Economic Growth and Tax-Competing Leviathans, forthcoming in International Tax and Public Finance (earlier version available as CESifo discussion paper no. 1140).

Shell, K., 1966, Toward a Theory of Inventive Activity and Capital Accumulation, American Economic Review 56, 56-62.

Wildasin, D.E., 2003, Fiscal Competition in Space and Time, Journal of Public Economics 87, 2571-2588.

Wilson, J.D., 1999, Theories of Tax Competition, National Tax Journal 52, 269-304.

Zodrow, G.R., P.M. Mieszkowski, 1986, Pigou, Tiebout, Property Taxation, and the Under-Provision of Public Goods, Journal of Urban Economics 19, 356-370.

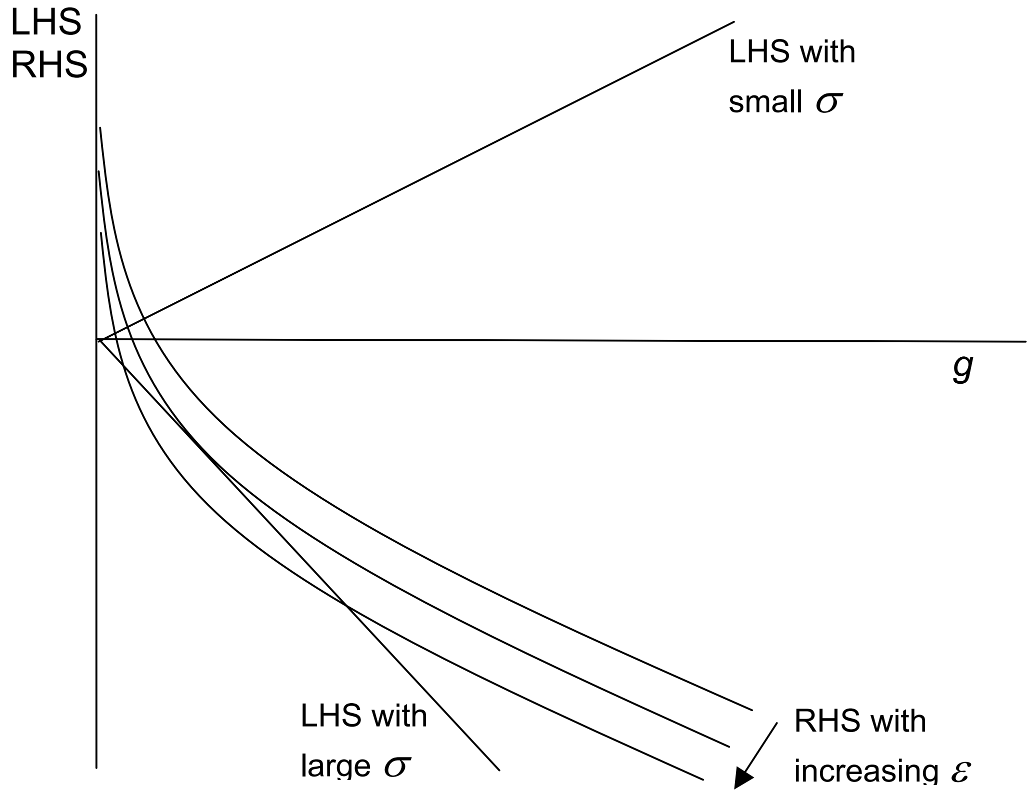

Figure 1: Graphical representation of Equation (8")

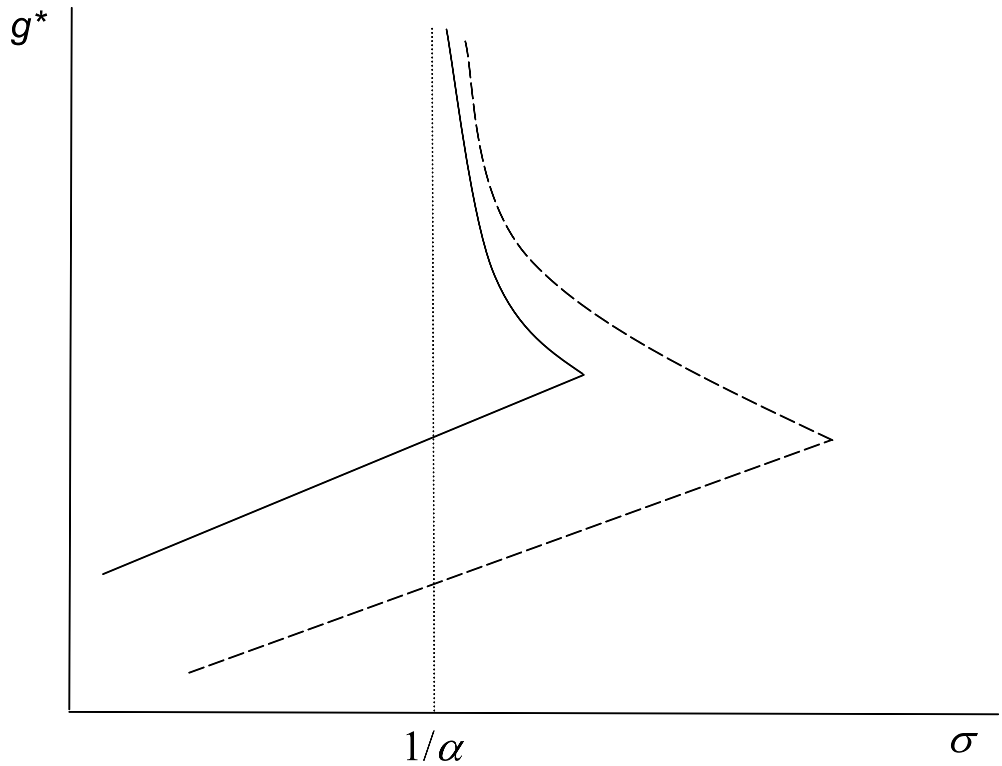

Figure 2: Comparative statics-effects on relative government expenditure, $g*$

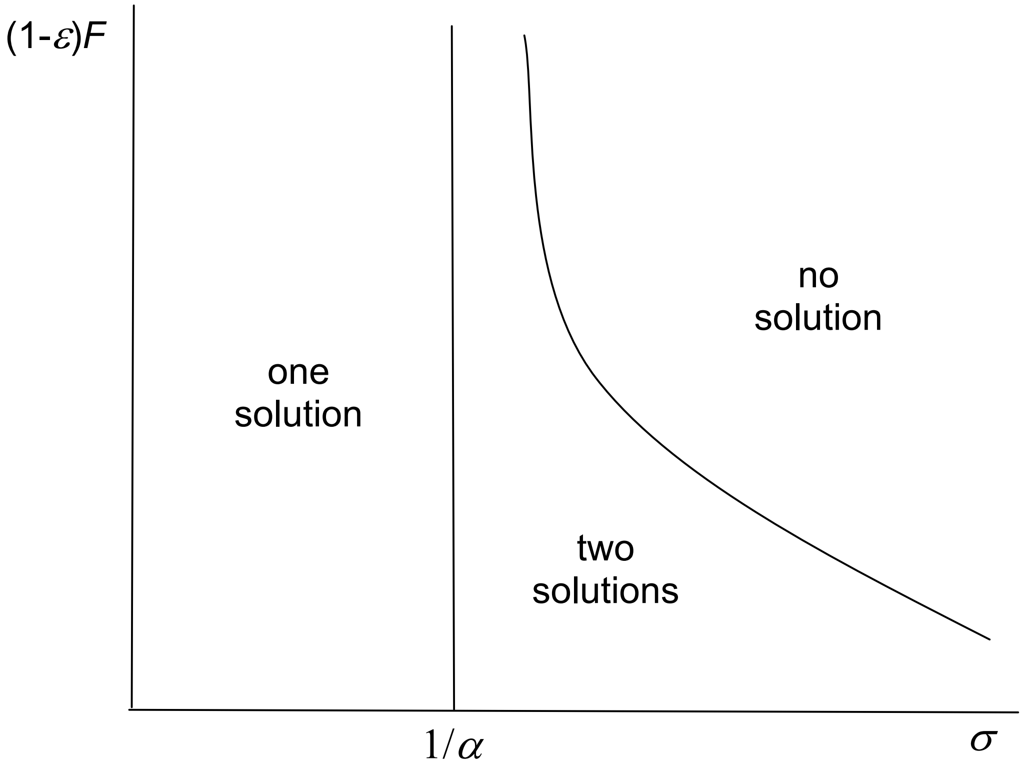

Figure 3: Bifurcation Diagram